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**Method for Storing, Transporting and Dispensing Cartons****Cross-reference to Related Applications**

(Not applicable)

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**Statement regarding Federally-sponsored Research and Development**

(Not applicable)

**Technical Field of the Invention**

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The invention relates to cartons used in packaging, and more specifically to a method for storing, transporting and dispensing cartons utilizing a coil, or spiral roll, of imbricated cartons.

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**Background of the Invention**

Cartons of various configurations are useful for packaging multiples of articles such as beverage cans and bottles. Such cartons, which may also be referred to as carriers, are typically stored in multiple quantities in collapsed condition and are erected just prior to being loaded. Collapsed cartons are generally stored in some rectangular configuration such as a rectangular box or simply a stack of the cartons themselves. In turn, boxes or stacks of cartons are often palletized into a larger rectangular configuration.

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Although collapsed cartons are typically stored in some sort of rectangular configuration, often it would be useful to have an alternate storage configuration. Alternate configurations are useful when the cartons have to be stored in an area that does not easily accommodate a rectangular pallet of cartons.

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In order to load cartons in a packaging machine it is necessary to transfer the cartons from their storage medium to a carton input apparatus of the packaging machine. Because packaging machines optimally operate at high rates of throughput,

cartons fed into the machine from a hopper, magazine or similar apparatus are quickly consumed and must be frequently replenished. Thus, the smaller the storage configuration for cartons, the more frequently the carton infeed apparatus must be replenished.

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The need for frequent carton replenishment places a demand upon the machine operator that increases the cost and diminishes the efficiency of a packaging operation. However, although larger boxes or stacks can reduce the replenishment requirements, it will be more difficult for an individual operator to handle extremely large boxes or stacks. The cost and efficiency of the packaging operation would again be negatively impacted if the machine operator has to handle extremely large boxes or stacks.

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It can be appreciated that it would be useful to have a means for storing and transporting cartons that reduces the need to frequently replenish the carton infeed apparatus and that is able to be easily managed by an operator.

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### Brief Summary of the Invention

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In accordance with a preferred embodiment of the invention, cartons are stored in imbricated fashion on a coil, or spiral roll.

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In accordance with another aspect of a preferred embodiment of the invention, an imbricated roll or coil of cartons is wound around a disk utilizing a length of a tape member.

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In accordance with a further aspect of a preferred embodiment of the invention a de-curler mechanism removes a curl that is imparted to cartons stored on a roll so as to restore the cartons to a substantially flat condition.

In accordance with still another aspect of the invention, a de-curler mechanism is comprised of a series of interacting rollers that impart a convex curvature to the cartons.

5           In accordance with yet a further aspect of the invention, a de-curler is comprised of a variable-radius mechanism

In accordance with an even further aspect of the invention, the de-curler is comprised of a cylindrical or corkscrew framework.

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In accordance with a final preferred embodiment of the invention, cartons are fed directly from the coil, or spiral roll, to a carton feeder having a series of carton engaging wheels. Each wheel revolves in a direction counter to its adjacent wheel.

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Other advantages and objects of the present invention will be apparent from the following description, the accompanying drawings, and the appended claims.

#### Brief Description of the Several Views of the Drawings

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Fig. 1 is a perspective illustration of a carton that is suitable for use in accordance with the teachings of a preferred embodiment of the invention;

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Fig. 2 is an illustration of the carton of Fig. 1 in collapsed condition;

Fig. 3 is a perspective illustration of a partially rolled coil of imbricated cartons in accordance with the teachings of the present invention;

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Fig. 4 is a perspective illustration of a fully rolled coil of imbricated cartons shown in a horizontal disposition;

Fig. 5 is an end elevation view of the collapsed carton of Fig. 2;

Fig. 6 is an end elevation view of a collapsed carton after it has been removed from storage on the coil shown in Figs. 3 and 4;

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Fig. 7 is a schematic representation of a coil being unrolled, the stream of curled cartons de-curved through a de-curling mechanism and the stream of cartons forwarded to a carton hopper in a packaging machine, in accordance with a preferred embodiment of the invention;

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Fig. 8 is a schematic representation of a carton de-curling mechanism in accordance with an alternate preferred embodiment of the invention;

Fig. 9 is a schematic representation of a carton de-curling mechanism in accordance with another alternate preferred embodiment of the invention; and

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Fig. 10 is a schematic representation of a coil being unrolled, the cartons forwarded to a carton hopper in curled condition, the cartons being withdrawn from the hopper by a multi-wheeled feeder in accordance with a further preferred embodiment of the invention.

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#### Detailed Description Preferred Embodiments of the Invention

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Throughout the drawings, the same reference numerals are used to denote the same or like features of the invention.

The invention teaches a methodology for storing collapsed cartons such as cartons for articles such as beverage cans or bottles in a spiral roll, or coil, of imbricated cartons. The term "imbricated" refers to the manner in which collapsed cartons are

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disposed in a continuous column in flat-face, overlapping fashion like fish scales or roof shingles.

Referring first to Fig. 1, therein is illustrated an end-loadable type carton 10 that  
5 is suitable for practicing a method for storing and transporting cartons in accordance with a preferred embodiment of the invention. Referring now to Fig. 2, therein is depicted the carton 10 of Fig. 1 in collapsed condition.

Referring now to Fig. 3 therein is shown a partially rolled coil 20 of imbricated  
10 collapsed cartons 10. The collapsed cartons 10 are wound around a spool 22 (which may also be considered a hub, disk or other suitable cylindrical foundation member). The cartons 10 to be wound are placed in a continuous, overlapping column with a band or belt 24 running longitudinally along the length of the column to facilitate winding and stability. In accordance with a preferred embodiment of the invention, flat,  
15 collapsed cartons 10 are treated like magazines or newspaper sections that are similarly rolled in imbricated coils. In the preferred embodiment illustrated, the continuous spiral is wound with the rotational axis of the spool disposed horizontally, producing a vertically oriented roll. Once the roll 20 is completed, it may be transported and/or stored in the same vertical disposition or in a horizontal disposition as shown in Fig. 4  
20 wherein the axis of the spool is oriented vertically.

The roll 20 is unwound to make the cartons 10 available for use in a packaging machine. Cartons are typically fed into a packaging machine for loading in substantially flat collapsed condition as shown in Fig. 2 and the end elevation view of  
25 Fig. 5. Cartons generally must be flat and uncurled because they must be manipulated by the machine and tightly loaded with articles within close tolerances. A carton 10 that has been stored on a roll 20 as described above typically is not flat but has a curved configuration as shown in the end elevation view of Fig. 6. The invention teaches "de-curling" (or "flattening") the curled carton prior to carton loading.

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Referring now to the schematic illustration of Fig. 7, one method of de-curling the cartons is to pass them through a de-curling assembly 30 consisting of a series of

rollers 32 that in effect impart a reverse curl. The rollers 32 apply a convex curvature to the cartons 10 that counteracts the concavity applied by the roll 20 thereby in effect producing a relatively flat carton 10. Stated differently, the reverse-curl de-curling process imparts a convex curvature that cancels, or negates, the concave curvature  
5 imparted by the roll 20.

In Fig. 7, the de-curling mechanism 30 is shown schematically preceded by a stream of curled cartons 12, which in turn is preceded by the roll 20 of cartons 10. The stream of de-curled cartons 13 is forwarded to a carton infeed assembly such as a carton  
10 hopper 14 as shown.

Figs. 8 and 9 schematically depict alternative de-curling mechanisms. Referring now to Fig. 8, a variable-radius de-curler 40 provides a convex surface for a simple reversal of the concavity imparted by the roll 20. The infeed stream 41 of cartons is  
15 drawn across the convex surface of the variable-radius device to produce an outfeed (with respect to the de-curler) carton stream 43 of substantially flat cartons ready for further processing in the packaging machine.

Referring now to Fig. 9, therein is depicted a cylindrical or corkscrew-like de-curling framework 50 in schematic representation. The infeed stream 51 of concavely-curved cartons from the roll 20 is run through the cylindrical framework 50 in the  
20 clockwise direction indicated by the arrow 55 to produce an outfeed stream 53 of substantially flat cartons.

Referring now to Fig. 10, therein is illustrated an alternate de-curling method in accordance with another preferred embodiment of the invention. In this embodiment, cartons 10 from the roll 20 are fed directly to a carton magazine or hopper 61. The cartons 10 in the hopper are still in a curled state at this point. The cartons 10 are withdrawn from the hopper 61 and placed in at least a partially-erected condition  
25 between flight bars or lugs 72 on an erected-carton conveyor 70 by a multi-wheeled carton-feeder mechanism 60 that is known in the packaging art.  
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The carton feeder 60 consists of multiple wheels 62, 64, 66 that rotate in opposite directions (as shown by rotational direction arrows 63, 65, 67). Each wheel 62, 64, 66 has suction cups 69 disposed at predetermined locations. Vacuum pressure is selectively applied to the suction cups 69 at predetermined intervals. In the first wheel 5 62 the suction cups 69 are attached to articulating members 68 that are propelled outwardly of the center of the wheel 62 at predetermined locations so as to engage a carton 10 in the hopper and extract the carton as the wheel 62 travels in its counter-clockwise motion 63. The selective application of vacuum together with synchronized rotation of the wheels causes the extracted carton to be transferred from the first wheel 10 62 to the second wheel 64, then transferred from the second wheel 64 to the third wheel 66, and ultimately deposited upon the conveyor 70 between its flight bars or lugs 72. The curvature of the cartons 10 that has been caused by the roll is reversed and the carton 10 is substantially flattened by the alternating rotational motions of the wheels 62, 64, 66.

15 The invention provides an alternative to storing cartons in rectangular boxes or stacks. As described above, the de-curved, or flattened, cartons are fed directly into a hopper, carton feeder assembly or other carton-receiving assembly such as a carton conveyor of a packaging machine in accordance with a preferred embodiment of the 20 invention. The cartons are unwound, uncurled and ultimately de-imbricated in a continuous stream. In this manner, a continuous supply of cartons greater than a supply from a box or stack of cartons is fed into the machine.